

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended) The session relay apparatus according to claim 15. ~~A session relay apparatus for performing session relay processing including congestion control processing and packet delivery control processing on a plurality of layers, characterized in that:~~

wherein each of the plurality of layers only creates the congestion control information, and the packet delivery control processing is concentrated in a scheduler on an IP (Internet Protocol) layer.

2. (original) The session relay apparatus according to claim 1, wherein reception buffers and transmission buffers corresponding to the plurality of layers are concentrated in a transmission buffer corresponding to the IP layer.

3. (currently amended): A session relay apparatus for realizing communication between a reception terminal and a transmission terminal by relaying data via ~~between a session to said transmission terminal and a session to said reception terminal,~~ the apparatus characterized by comprising:

a session relay unit, corresponding to the session, comprising:

reception session processing means ~~for receiving data from the session to said~~
transmission terminal;

transmission buffering means for temporarily storing the data received from the
transmission terminal in a transmission buffer,

transmission session processing means for receiving data from the ~~transmitting~~
~~data to the session to said~~ reception terminal,

wherein the transmission session processing means calculates an amount of
transmissible data based on the data received from the reception terminal;

~~a transmission buffer for temporarily storing data delivered to said transmission terminal;~~

packet scheduling means ~~a packet scheduler~~ for controlling delivery of the data ~~a packet~~
~~delivery from stored in the said transmission buffer, based on the amount of transmissible data;~~

and

delivery control means for delivering the ~~controlling the delivery of~~ data stored in the
~~said transmission buffer in response to the control of~~ the packet scheduling means ~~said packet~~
~~scheduler,~~

~~wherein said transmission session processing means calculates the amount of data which~~
~~is permitted to be delivered on the layer, and said packet scheduler controls the packet delivery~~
~~based thereon.~~

4. (original) The session relay apparatus according to claim 3, wherein:

said reception session processing means performs reception processing for data from a TCP (Transmission Control Protocol) session,

said transmission session processing means processes data for delivery to the TCP session, and notifies said packet scheduler of the amount of data which can be delivered, as determined by TCP window flow control, and

said packet scheduler performs scheduling processing based on the notified amount of data.

5. (currently amended): The session relay apparatus according to claim 3,

wherein the session relay apparatus comprises a plurality of session relay units, and

wherein said packet scheduling means scheduler determines a session relay unit from the plurality of session relay units from which to deliver a packet, in which a packet is delivered
based on a communication resource allocation policy including at least;

a bandwidth and a bandwidth ratio allocated to the session corresponding to the determined session relay unit,

the amount of data that is permitted to be delivered (transmissible data) calculated by the notified from said transmission session processing means, and

an the amount of data stored in said the transmission buffer, to control the data delivery from each of the sessions.

6. (currently amended): The session relay apparatus according to claim 3, wherein the packet scheduling means ~~said packet scheduler~~ further comprises:

accumulating means for accumulating unused communication resources for each session of a plurality of sessions ~~in each of the sessions~~, and facilitating ~~makes~~ communication using the accumulated communication resources ~~accumulated in said accumulating means~~ when the communication resources are required.

7. (original): The session relay apparatus according to claim 6, wherein said transmission buffer contains data to be delivered, and said packet scheduler accumulates only a bandwidth of the communication resources rendered free by a restriction on the amount of delivery permitted data from said delivery control means.

8. (currently amended): The session relay apparatus according to claim 3, further comprising means for dynamically changing a control parameter of the ~~transmission~~ session, wherein the control parameter is changed in accordance with a data delivery situation from said packet scheduler.

9. (original): The session relay apparatus according to claim 8, wherein the control parameter of the session is changed in a direction in which an output bandwidth from the session decreases when a free bandwidth of the session increases,

the control parameter of the session is changed in a direction in which the output bandwidth from the session increases when the free bandwidth of the session decreases, and

the change of the control parameter is stopped when congestion is caused by a change in the control parameter.

10. (currently amended): The session relay apparatus according to claim 9, further comprising means for dynamically changing ~~the~~an amount of allocated communication resources including at least a bandwidth and a bandwidth ratio allocated to the session~~each of the sessions~~,

wherein the control parameter is changed in accordance with a data delivery situation from ~~said the~~ packet scheduler and an ~~the~~ amount of data available for communication notified from the said delivery control means.

11. (currently amended): The session relay apparatus according to claim 10, wherein resources allocated to the session are reduced when ~~the~~ free bandwidth of the session increases, the resources allocated to the session are increased with its initial value defined as an upper limit when the free bandwidth of the session decreases, and the allocated resources are increased or decreased in accordance with the amount of transmissible data notified from said delivery control means or an average thereof.

12. (currently amended) The session relay apparatus according to claim 3, including transmission rate control means for controlling transmission control information including at least a bandwidth, availability of transmission, and the amount of ~~data amount of data that is permitted to be delivered~~ transmissible data for controlling transmission processing for a session from said transmission terminal, wherein the transmission control information ~~to said transmission terminal~~ is changed or generated in accordance with ~~a~~ the free capacity of ~~the said~~ transmission buffer and information from said packet scheduler.

13. (currently amended): The session relay apparatus according to claim 12, further comprising means for receiving packet delivery information from ~~said the~~ packet scheduler, and means for checking ~~said the~~ transmission buffer for ~~the a~~ free capacity changed by a delivered packet, wherein a dispatch confirmation packet is transmitted to ~~the said~~ transmission terminal to prompt the same to resume a transmission when the free capacity of ~~the said~~ transmission buffer increases to a certain amount or more after a packet has been delivered.

14. (currently amended): The session relay apparatus according to claim 12, further comprising means for examining at least one of ~~the a~~ free capacity of ~~the said~~ transmission buffer and an average thereof, wherein ~~the said~~ transmission terminal is instructed to reduce a transmission bandwidth in accordance with the free capacity.

15. (currently amended): A session relay apparatus for realizing a communication between a transmission terminal and a reception terminal ~~via~~ by relaying data between a session to said transmission terminal and a session to said reception terminal, the apparatus characterized by comprising:

a session relay unit, corresponding to the session, comprising:

reception session processing means provided in correspondence to a plurality of layers for receiving data from the ~~session to said~~ transmission terminal;

transmission buffering means for temporarily storing the data received from, the transmission terminal in a transmission buffer,

transmission session processing means provided in correspondence with the plurality of layers for receiving data from the ~~transmitting data to the session to said~~ reception terminal,

wherein the transmission session processing means calculates an amount of transmissible data based on the data received from the reception terminal;

a transmission buffer for temporarily storing data delivered to said transmission terminal;

and

packet scheduling means ~~a packet scheduler~~ for controlling the delivery of the data stored in the ~~packets from said~~ transmission buffer, based on the amount of transmissible data

~~wherein each of said transmission session control means calculates the amount of data permitted to be delivered on an associated layer, and said packet scheduler controls the packet delivery based on the amount of data permitted in common on all of the plurality of layers.~~

16. (currently amended): The session relay apparatus according to claim 15, wherein said layers include an internet Small Computer System Interface (iSCSI) ~~iSCSI (internet Small Computer System Interface)~~ layer as one of the layers for conducting congestion control, and the amount of transmissible data is determined on the basis of the amount of receivable data received from ~~the said~~ reception terminal on the iSCSI layer

17. (currently amended) The session relay apparatus according to claim 15, further comprising:

means for receiving packet delivery information from said packet scheduling
means~~packet scheduler~~; and

means for checking the said transmission buffer for a free capacity changed by a delivered packet,

wherein ~~the an~~ amount of receivable data is generated for ~~said the~~ transmission terminal to prompt the same to resume a transmission when the free capacity of ~~said the~~ transmission buffer increases to a certain amount or more after a packet has been delivered.

18. (currently amended): The session relay apparatus according to claim 3, wherein ~~said~~ the reception session processing means directly stores ~~a-received data packet-in the said~~ transmission buffer, and directly delivers the data packet-from the said-transmission buffer.

19. (currently amended): The session relay apparatus according to claim 3, wherein data is written from an application program into ~~said-the~~ transmission buffer, and received data is passed to the application program.

20. (currently amended): The session relaying method according to claim 34 ~~A session relaying method for a session relay apparatus for performing session relay processing including congestion control processing and packet delivery control processing on a plurality of layers, characterized in that:~~

wherein each of the plurality of layers only creates the congestion control information, and the packet delivery control processing is concentrated in a scheduler on an IP (Internet Protocol) layer scheduler.

21. (original): The session relaying method according to claim 20, wherein a reception buffer and a transmission buffer corresponding to the plurality of layers are concentrated in a transmission buffer corresponding to the IP layer.

22. (currently amended): A session relaying method for a session relay apparatus for realizing a communication between a reception terminal and a transmission terminal by relaying data via between a session from a plurality of sessions to said transmission terminal and a session to said reception terminal, characterized by comprising, on said session relay apparatus side the method comprising:

receiving data from the a reception session step of receiving data from the session to said transmission terminal;

temporarily storing the data received from the transmission terminal in a transmission buffer;

receiving data from the a transmission session step of transmitting data to the session to said reception terminal;

wherein an amount of transmissible data is calculated based on the data received from the reception terminal;

a step of temporarily storing data delivered to said transmission terminal in a transmission buffer;

controlling delivery of the data stored in the transmission buffer based on the amount of transmissible data a step of controlling a packet delivery from said transmission buffer in a packet scheduler; and

~~delivering the data stored in the transmission buffer in accordance with the controlling of the delivery~~ a step of controlling the delivery of data stored in said transmission buffer in response to the control of said packet scheduler in delivery control means;

~~wherein said transmission session processing calculates the amount of data which is permitted to be delivered on the layer, and said packet scheduler controls the packet delivery based thereon.~~

23. (original): The session relaying method according to claim 22, comprising a step for performing reception processing for data from a TCP (Transmission Control Protocol) session,

wherein said transmission session step processes data for delivery to the TCP session, and notifies said packet scheduler of the amount of data which can be delivered, as determined by TCP window flow control, whereby said packet scheduler performs scheduling processing based on the notified amount of data.

24. (currently amended): The session relaying method according to claim 22, further comprising;

~~determining a session from the plurality of sessions for which to deliver a packet the step of determining a session in which a packet is delivered, by said packet scheduler,~~ based on a communication resource allocation policy including at least;

a bandwidth and a bandwidth ratio allocated to the determined session,

the amount of transmissible data ~~notified from said transmission session processing~~
~~means, and~~

~~an the amount of data stored in the said transmission buffer, to control the data delivery~~
~~from each of the sessions.~~

25. (currently amended): The session relaying method according to ~~any of~~ claim 22,
further comprising:

accumulating wherein said packet scheduler further comprises accumulating means for
~~accumulating~~ unused communication resources in each of the plurality of sessions, and

facilitating communication between the reception terminal and the transmission terminal
~~said method further comprising the step of making a communication using the accumulated~~
communication resources ~~accumulated in said accumulating means when the communication~~
~~resources are required in said packet scheduler.~~

26. (currently amended): The session relaying method according to claim 25, further
comprising:

accumulating the step of accumulating, by said packet scheduler, only a bandwidth of the
communication resources rendered free by a restriction on the amount of transmissible data
~~delivery permitted data from said delivery control means,~~

wherein said transmission buffer contains data to be delivered.

27. (currently amended): The session relaying method according to claim 22, further comprising:

~~dynamically changing the step of changing~~ a control parameter of the ~~transmission~~ session in accordance with a data delivery situation ~~from said packet scheduler by means for dynamically changing the control parameter.~~

28. (currently amended): The session relaying method according to claim 27, further comprising:

~~dynamically changing the step of changing~~ the control parameter of the session in a direction in which an output bandwidth from the session decreases, ~~if when~~ a free bandwidth of the session increases,

~~dynamically~~ changing the control parameter of the session in a direction in which the output bandwidth from the session increases, ~~if when~~ the free bandwidth of the session decreases, and

stopping the dynamic change of the control parameter when a congestion is caused by a change in the control parameter.

29. (currently amended): The session relaying method according to claim 28, further comprising:

~~dynamically changing the step of changing~~ the control parameter in accordance with a data delivery situation ~~from said packet scheduler~~ and the amount of ~~transmissible data data~~ available for communication ~~notified from said delivery control means~~ by means for dynamically changing ~~the an~~ amount of allocated communication resources including at least a bandwidth and a bandwidth ratio allocated to each session of the plurality of ~~of the~~ sessions.

30. (currently amended): The session relaying method according to claim 29, further comprising:

~~the step of~~ reducing resources allocated to the session ~~if when~~ the free bandwidth of the session increases,

increasing ~~the~~ resources allocated to the session with its initial value defined as an upper limit ~~if when~~ the free bandwidth of the session decreases, and

increasing or decreasing the allocated resources in accordance with the amount of transmissible data ~~notified from said delivery control means~~ or an average thereof.

31. (currently amended): The session relaying method according to any of claims 22 to 29, further comprising:

~~the step of~~ changing or generating the transmission control information to said transmission terminal in accordance with the free capacity of said transmission buffer and information from said packet scheduler by transmission rate control means for controlling

transmission control information including at least a bandwidth, availability of transmission, and the amount of transmissible data for controlling transmission processing for a session from said transmission terminal.

32. (currently amended): The session relaying method according to claim 31, further comprising;

~~the step of~~ transmitting a dispatch confirmation packet to the said transmission terminal to prompt the same to resume a transmission when the free capacity of the said transmission buffer increases to a certain amount or more after a packet has been delivered.

33. (currently amended): The session relaying method according to claim 31, further comprising;

~~the step of~~ instructing said transmission terminal to reduce a transmission bandwidth in accordance with a free capacity examined by means for examining at least one of the free capacity of the said transmission buffer and an average thereof.

34. (currently amended): A session relaying method for a session relay apparatus for realizing a communication between a transmission terminal and a reception terminal via ~~by relaying data between a session from a plurality of sessions, to said transmission terminal and a~~

~~session to said reception terminal, characterized by comprising, on said session relay apparatus side the method comprising:~~

~~receiving data from the a reception session step of receiving data from the session to said transmission terminal in each of a plurality of layers;~~

~~temporarily storing the data received from the transmission terminal in a transmission buffer;~~

~~receiving data from the a transmission session step of transmitting data to the session to said reception terminal in each of the plurality of layers,~~

~~wherein an amount of transmissible data is calculated based on the data received from the reception terminal, for each of the plurality of layers;~~

~~a step of temporarily storing data delivered to said transmission terminal in a transmission buffer; and~~

~~controlling delivery of the data stored in the transmission buffer based on the amount of transmissible data common to all of the plurality of layers a step of controlling the delivery of packets from said transmission buffer in a packet scheduler;~~

~~wherein the amount of data permitted to be delivered on an associated layer is calculated in each of the transmission session processing, and said packet scheduler controls the packet delivery based on the amount of data permitted in common on all of the plurality of layers.~~

35. (currently amended): The session relaying method according to claim 34, wherein ~~said the plurality of~~ layers include an ~~iSCSI~~ (internet Small Computer System Interface) (iSCSI) layer as one of layers for conducting congestion control, and said method further comprises ~~the step of~~ determining the amount of transmissible data on the basis of ~~an the~~ amount of receivable data received from ~~the said~~ reception terminal on the iSCSI layer.

36. (currently amended): The session relaying method according to claim 34, further comprising:

~~the step of~~ generating ~~an the~~ amount of receivable data for ~~the said~~ transmission terminal to prompt the same to resume a transmission when the free capacity of ~~the said~~ transmission buffer increases to a certain amount or more after a packet has been delivered.

37. (currently amended): The session relaying method according to claim 22, wherein ~~the receiving of the data from the transmission terminal said reception session step~~ further comprises ~~the step of~~ directly storing ~~the a received data packet in said in the~~ transmission buffer, and directly delivering the ~~data packet from the said~~ transmission buffer.

38. (currently amended): The session relaying method according to claim 22, further comprising the step of writing data from an application program into ~~the said~~ transmission buffer, and passing received data to the application program.